

FY 1981 RDT&E DESCRIPTIVE SUMMARY

Program Element: # 12431F

Title: Defense Support Program

Budget Activity: Strategic Programs, # 3

RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1979 <u>Actual</u>	FY 1980 <u>Estimate</u>	FY 1981 <u>Estimate</u>	FY 1982 <u>Estimate</u>	<u>Additional to Completion</u>	Total Estimated Costs
TOTAL FOR PROGRAM ELEMENT		30,550	31,000	72,900	135,300	Continuing	Not applicable

BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Defense Support Program (DSP) is the key element of the Worldwide Military Command and Control System. The system's current deployment consists of satellites and two dedicated ground readout stations to perform surveillance of the Eastern and Western Hemispheres.

BASIS FOR FY 1981 RDT&E REQUEST: Funds are included for continuing the development of payload modifications for compatibility with Shuttle/Titan 34D Inertial Upper Stage. This is the peak funding year for satellite # 14 design. This year will complete design of Mobile Ground Terminals and (contingent upon securing FY 80 funds and Congressional approval) development of a satellite status capability for the Simplified Processing Station. A new start for this year is the design and development of user interface so the ground based users can receive and process Mobile Ground Terminal data.

OTHER APPROPRIATION FUNDS:

	FY 1979 <u>Actual</u>	FY 1980 <u>Estimate</u>	FY 1981 <u>Estimate</u>	FY 1982 <u>Estimate</u>	<u>Additional to Completion</u>	Total Estimated Costs
Procurement (3020) (Quantity)	123,400 (3 retrofit)	103,862 (1 retrofit)	51,931	192,280 (1 New)	Continuing	Not applicable
Procurement (3080)* (Quantity)	17,258	26,574	90,132 (3 MGT's)	10,733	Continuing	Not applicable

* Includes initial spares

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DETAILED BACKGROUND AND DESCRIPTION: The Defense Support Program (DSP) was developed
DSP satellites contain infrared sensors.
The system is operational

to the National Command Authorities (NCA) and other designated users.

Two dedicated ground stations,
one overseas and one within the Continental United States (CONUS)
Simplified Processing Station provides a backup capability to the current ground stations to enhance mission data survivability and increase the probability that data will be available. It is currently deployed in the CONUS, but can be moved overseas in about a two week period. The Joint Chiefs of Staff have designated the Aerospace Defense Command, Strategic Air Command, National Military Command System, Atlantic Command, Pacific Command, European Command, as users of DSP data. Evolutionary satellite improvements are intended to prolong the useful life of each satellite, make the satellite more survivable, increase the viewing area of each satellite, and increase the accuracy of data provided for the NCA decision-making process. Modifications under development will ensure that the DSP payloads are compatible with Shuttle/Titan 34D/Inertial Upper Stage (IUS) capabilities. The Mobile Ground Terminals will provide DSP data survivability by developing a truck mounted data processing and communication capability

RELATED ACTIVITIES:

Defense Satellite Communications System (P.E. 33110F) provides primary communications routing for DSP overseas data. Space Boosters (P.E. 35119F) provides launch support. Space Vehicle Subsystems Advanced Development (P.E. 63461F) is developing technology for improved satellite stabilization techniques. The National Emergency Airborne Command Post (P.E. 32015F) and Post-Attack Command and Control System (P.E. 11312F) are potential users of DSP data. DSP is the key element of the Worldwide Military Command and Control Systems (WWMCCS)

After transition to the Space Shuttle, Space Launch Support (P.E. 35171F) will provide IUSs and Space Shuttle flights for DSP missions. DSP Communications (P.E. 12447F) provides operations and maintenance for the DSP Ground Communication Network.

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WORK PERFORMED BY: Commander-in-Chief, Aerospace Defense Command, maintains operational control of Defense Support Program (DSP) for the Joint Chiefs of Staff. Strategic Air Command and the Air Force Communications Command have become the system operators and maintainers of the DSP ground stations. Air Force Systems Command's Space Division, Los Angeles, CA, has overall development and procurement management responsibility. The Air Force Logistics Command provides engineering and logistics support. Air Force Weapons Laboratory, Kirtland AFB, NM, will provide facility support. The Air Force Test and Evaluation Center, Kirtland AFB, NM participates in test and evaluation of selected system segments. TRW, Redondo Beach, CA is the prime contractor for the spacecraft and satellite integration. Aerojet Electro Systems Company, Azusa, CA, is the prime contractor for the infrared sensor. Ford Aerospace and Communications Corporation, Western Development Laboratories, Palo Alto, CA, is the prime contractor for the Data Acquisition and Communications segments. The Martin Company, Denver, CO, builds the Titan IIIC booster. The Department of Energy (Sandia Corporation) IBM Thousand Oaks, CA is the prime contractor for all software efforts as well the prime contractor on the Simplified Processing Station. Technology Corporation is the prime contractor for the Ground Communications Network. The Aerospace Corporation, Inglewood, CA, furnishes general systems engineering/integration for the DSP System Program Office.

PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1979 and Prior Accomplishments: Significant accomplishments to date include procurement of 13 satellites and 12 Titan IIIC boosters, construction of two data processing facilities, and provision of user displays, software, communications and a training facility (also used for software development and mission data analysis), completion of Research and Development (R&D) for modifications to satellites 10-12 to improve survivability and to provide data survivability, completion of R&D for an improved focal plane for satellite 13 and completion of development of hardware and software for the Simplified Processing Station. Development initiated in FY 1976, continues on an improved sensor to provide increased viewing area

In June 1976, a software package was delivered

modifications for satellite retrofit to improve survivability was initiated. Development of R&D support for DSP augmentation was completed. Ground station modifications for compatibility with a satellite anti-jam command capability were completed. Satellite Tracking Set Training Equipment was delivered.

Critical Design Review was conducted in June 1978 on a new sensor

ensuring TITAN 34D/Shuttle Inertial Upper Stage (IUS) compatibility continued. In December 1978 the prototype Simplified Processing Station (SPS) was shipped for Initial Operational Test and Evaluation. The testing was completed in June 1979. A satellite calibration experiment was performed to determine infrared sensor responsivity.

2. FY 1980 Planned Program: Expenditures include the continuation of the DSP satellite compatibility development with the Shuttle/TITAN 34D IUS. This development is necessary to ensure that the DSP satellites are compatible with the IUS interfaces and support the program transition to a Shuttle launch capability. The development efforts will be applied to insure that the system design will incorporate launch and recovery loads, safety requirements, interface compatibility and contamination protection. The current plan for DSP satellite launches is as follows: one more TITAN IIIC launch; two TITAN 34D/IUS launches; and all subsequent launches on Shuttle/IUS. The development of the sensor structural test model will be continuing. The purpose of this model is to verify the sensor loads compatibility with each of these launch vehicles. Work will be completed on the improved spacecraft data transmission capability development. This development will increase the reliability of the high-power data transmission to the ground so DSP data can be received in a small antenna. The Link II satellite status development for the SPS will be completed. This capability will allow the SPS personnel to monitor the health and status of the satellite in its role of improving DSP data survivability. The design of the next new satellite will begin. Extensive new design of the spacecraft will be required to incorporate new sensors, survivability features and because many components used in previous satellites are no longer available because of obsolescence. Funds were requested to start Mobile Ground Terminals (MGTs). They were deleted by the Appropriations Conference on the basis that they were premature.

After submission of the study an attempt will be made to obtain the FY 1980 design funds and Congressional approval to proceed. The purpose of the MGT is to provide DSP data by mobilizing and proliferating the data processing and communication functions. The FY 1981 MGT program schedule depends on starting the design in FY 1980. Orbital operations data analysis, survivability and satellite improvement studies will continue.

3. FY 1981 Planned Program: A major part of the FY 1981 funds will be applied to continuing development of the payload TITAN 34D/IUS compatibility and the design of the next new group of satellites. This is the peak year for the satellite design. The current plan is to procure four new satellites of this design, one each of the following years; FY 1982, FY 1983, FY 1984, and FY 1986. The purpose of these satellites is to replace operational satellites that have

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worn out and can no longer accomplish the mission. The Mobile Ground Terminal (MGT) design will be completed with a Critical Design Review. Based on a successful review, a production option for the procurement of the three MGTs will be exercised. The design and development of user interfaces for the ground based users to receive MGT data will begin. The purpose of this capability is to ensure that each can receive and process Defense Support Program data from all sources and keep common data at each command center for as long as possible. No attempt will be made to have elaborate association/correlation schemes. Funding is planned for the development of a direct line-of-sight Ultra High Frequency communication capability from the Simplified Processing Station to an Airborne Command Post. This capability will provide an emergency method for the airborne user to obtain Defense Support Program data. Studies on survivability, orbital data and system improvements will continue.

4. FY 1982 Planned Program: Plans include continuing Shuttle/Titan 34D/Inertial Upper Stage (IUS) compatibility; however, at a lower funding rate than in the previous years. The design of the future satellite will be completed. The MGT user interface design and development will be completed. Prototype development for a MGT that will be compatible with the follow-on Defense Support Program system will begin. Continued studies on system survivability, performance improvements, and orbital data analysis are planned.

5. Program to Completion: This is a continuing program. RDT&E funding will support continuing satellite/system development in support of Department of Defense requirements. Primary emphasis will be directed toward eliminating or minimizing operational employment deficiencies, the use of the Space Shuttle and/or Titan 34D/IUS in lieu of the Titan IIIC, the development of the MGT capability and the adequacy of the ground station data processing capability.

6. Milestones:

	<u>Date</u>
A.	
B.	
C.	
D. Delivery of Satellite #5	Mar 73
E.	
F. Delivery of Satellite #6	Jul 73
G. Delivery of Dual Satellite Software	Feb 74
H. Delivery of Satellite #8	May 74
I. Delivery of Satellite #7	Oct 74
J. Delivery of Satellite #9	Mar 75
K.	
L.	
M.	
N. Delivery of Simplified Processing Station (SPS)	Dec 78
O.	

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P. Deliver Simplified Processing Station Link Status Capability	4Q CY 80
Q. Retrofit of Titan 34D/Inertial Upper Stage (IUS) Compatible Satellite Complete	3Q CY 81
R. Retrofit of IUS Compatible Satellite Complete	1Q CY 82
S. Initial Operational Capability of Mobile Ground Terminals	4Q CY 83
T. Satellite Launches	As required

7. Resources: Not applicable

8. Comparison with FY 1980 Budget Data:

Project Number	Title (If Applicable)	FY 1978 <u>Actual</u>	FY 1979 <u>Estimate</u>	FY 1980 <u>Estimate</u>	FY 1981 <u>Estimate</u>	Additional <u>to Completion</u> Continuing	Total <u>Estimated</u> <u>Costs</u> Not applicable
		28,745	32,300	44,400	53,200		

FY 1979 actual was lower than FY 1979 estimate because of the deferral of satellite 14 procurement from FY 1981 to FY 82, this deferred the need to start the design from FY 79 to FY 80.

FY 1980 estimate is lower because the Appropriations Conference deleted \$13,400 requested for the start of the Mobile Ground Terminal design.

In the FY 1981 estimate, funding requirements for satellite 14 design increased to account for most of the program growth. Inflation accounted for a portion of the FY 1981 estimate increase over last year's estimate.

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Test and Evaluation Data

1. Development Test and Evaluation: The Defense Support Program (DSP) has been designed, developed, tested and deployed as an operational system in the early 1970's. The system is a classified space program consisting of ground control and readout stations that receive data from satellites, process the data, and

information to the National Command Authorities and military commanders for decision making purposes. Development Test and Evaluation/Initial Operational (DI&E/IOT&E) on the prototype Simplified Processing Station (SPS) was completed in 1978. The testing indicated that the SPS met most of its specifications and it was recommended that Initial Operational Test and Evaluation (IOT&E) be accomplished. All discrepancies and deficiencies uncovered to date have been resolved or are planned to be resolved jointly by Aerospace Defense Command and Air Force Systems Command (AFSC). Maintainability and reliability testing of the system was conducted by the system operator. There is a continuing effort to upgrade the satellites and ground facilities for improved system performance and survivability. Development Test and Evaluation will be accomplished for each of these improvements.

2. Operational Test and Evaluation:

(a) Combined DT&E and IOT&E was performed on the DSP prototype SPS from 26 August 1978 to 6 November 1978 at Vandenberg Air Force Base, CA. This combined test was then followed by dedicated IOT&E from 16 April 1979 to 16 June 1979. The HQ Space Division was responsible for DT&E while the Air Force Test and Evaluation Center, assisted by personnel from the Aerospace Defense Command (operating for DSP), managed and conducted IOT&E.

(b) IOT&E was conducted with prototype SPS hardware and software. The objectives were to evaluate the system's performance and to estimate the reliability, availability, and maintainability of an operationally deployed system. The October 1979 IOT&E report identified three major deficiencies which would prevent the SPS from being operationally effective. These were: (1)

(3) Excessive computer-generated message error rate - Mission messages were periodically rejected at the data distribution center because of parity error. As a result, mission messages were lost.

(d) All major deficiencies are to be corrected by the SPS contractor, International Business Machines, before

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the start of follow-on test and evaluation which is tentatively scheduled for a 30 day period in January 1980. The FOT&E will be performed in two phases at the permanent SPS location. The first phase will be conducted by Air Force Test and Evaluation Center to verify correction of IOT&E deficiencies and to further refine reliability, availability and maintainability estimates. The second phase will be conducted by the Aerospace Defense Command to develop operations and maintenance techniques, doctrine, and training for the system. Follow-on Test & Evaluation results will be used to support decisions concerning the deployment of the prototype Simplified Processing Station as an operational system.

3. System Characteristics:

Characteristics

Objectives

Demonstrated

For the current operational system

Simulation
Live events

Simulation
Live events

Simulation
Live events

Simulation

Operational
Experience

Operational
Experience

Simulation
Limited live events

Simulation
Limited live events

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For the Simplified Processing Station

Objectives

Demonstrated

Development Test &
Evaluation (DT&E), about
for simulated scenario
during Initial Operational
Test & Evaluation
(IOT&E)

DT&E, during
IOT&E

DT&E, IOT&E

DT&E, IOT&E

— during IOT&E

— per week during IOT&E

DT&E, IOT&E

DT&E only